

Targeted Temperature Management

TTM2 Trial Practicality and Generalizability

The TTM2 study, published in June 2021, examined the use of temperature management in 1,900 out-of-hospital cardiac arrest adult patients.¹

One of the ongoing discussions on the results of the TTM2 trial focuses on the fact that the characteristics of the patient population do not reflect the patient population in the United States.

TTM2 Patient Characteristics



- Patients were relatively young (64 yrs) and predominantly male (80%)
- Presumed 100% cardiac cause
- 92% of arrests were witnessed and nearly 80% received bystander CPR

TTM2 Patient Population Is Different than What Is Seen in Europe

- 77% of patients in the TTM2 trial were in countries with CPR bystander rates above 70%, associated with a median no-flow time of < 1 minute.¹
- In most of Europe, the rate of witnessed arrests and bystander CPR is in the range of 40%^{8,9,10} with an average no-flow time of 9 minutes.⁷ The longer no-flow time translates to a significantly longer hypoxia time compared to the TTM2 population.

| TTM - Stay Up to Date






The Penn Medicine's TTM Academy Podcast
with Benjamin Abella, MD, MPhil

ZOLL[®]

TTM2 Patient Characteristics - A Comparison

The TTM2 trial should not be generalized because of the major differences in population. This leads to one of most important questions to a clinician: "Is my patient population the same as TTM2?"

	TTM2 ¹ , 2021	CARES, 2022 ²	Lim 2020 ³	Fischer, 2022 ⁴	HLR, 2021 ⁵	Mainsel, 2020 ⁶
Population	Europe, OHCA	All US, cohort all OHCA	Singapore, cohort all OHCA	All GER, all OHCA	Sweden cohort, all OHCA	France, cohort all OHCA
 Witnessed Arrest	92%	38%	61%	50%	46%	64%
 Bystander CPR	80%	35%	46%	44%	33%	45%
 Initial rhythm shockable	72%	16%	18%	20%	29%	6%



The European Resuscitation Council (ERC) guidelines were updated together with the European Society of Intensive Care Medicine (ESICM) in 2022. They recommend continuous monitoring of core temperature and active fever prevention (>37.7°C) for at least 72h in patients who remain in coma after cardiac arrest. There was

insufficient evidence to recommend for or against temperature control at 32-36°C or early cooling after cardiac arrest. In addition, comatose patients with mild hypothermia should not be actively rewarmed after return of spontaneous circulation (ROSC) to achieve normothermia. Prehospital cooling with rapid infusion of large volumes of cold intravenous fluids is not recommended after ROSC.¹¹

Conclusion

The ERC guidelines emphasize the importance of TTM for IHCA/OHCA. The European patient population is much different from the TTM2 trial population; therefore, the trial results should not be generalized. Clinicians must consider the individual needs of their patients in order to deliver high-quality temperature management.



Sources:

- Dankiewicz et al. Hypothermia versus Normothermia after Out-of-Hospital Cardiac Arrest. NEJM 2021; 384:2283-2294
- 2021 Annual Report. CARES - Cardiac Arrest Registry to Enhance Survival. Downloaded on August 21, 2022 from https://mycares.net/sitepages/uploads/2022/2021_flipbook/index.html?page=1
- Lim et al. Incidence and Outcomes of Out-of-Hospital Cardiac Arrest in Singapore and Victoria: A Collaboration Study. J AM Heart Assoc. 2020;9:e015981
- Fischer, M, et al. Öffentlicher Jahresbericht 2020 des Deutschen Reanimationsregisters. Außerklinische Reanimation 2021. Downloaded on August 21, 2022 from www.reanimationsregister.de/berichte.html
- Årsrapport för år 2020 Hjärt-Lungradningsregistret. Downloaded on August 21, 2022 from <https://arsrapporter.registercentrum.se/shlr/20210929>
- Mainsel A, et al. Management of out-of-hospital cardiac arrests in a French territory. Med Emergency, MJEM 2020;28:9-16
- Empana P, et al. Incidence of Sudden Cardiac Death in the European Union. J Am Coll Cardiol 2022;79:1818-1827
- Chan et al. Outcomes for Out-of-Hospital Cardiac Arrest in the United States During the Coronavirus Disease 2019 Pandemic. JAMA Cardiology 2021;6(3):296-303
- Kotini-Shah et al. Sex differences in outcomes for out-of-hospital cardiac arrest in the United States. Resuscitation 163 (2021);6-13
- Berger et al. Substantial variation exists in post-cardiac arrest outcomes across Michigan hospitals. Resuscitation 159 (2021);97-104
- Sandroni C, et al. "ERC-ESICM guidelines on temperature control after cardiac arrest in adults." Intensive care medicine vol. 48.3 (2022): 261-269. doi:10.1007/s00134-022-06620-5.